

## 30A LEVEL DISTRIBUTION REGISTER

### DESCRIPTION

### STEP-BY-STEP SYSTEMS

#### 1. GENERAL

1.01 This section covers the use and a general description of the 30A Level Distribution Register (LDR).

1.02 The 30A LDR is used in conjunction with the 2B (or D-157641) noise measuring set to provide a means for automatically recording the number of seconds in a 50-second period, that the noise level on telephone lines exceeds one or both of two predetermined levels on each of a series of test calls. The 2B set amplifies and weights the noise signal as to frequency response and supplies the input signal to the LDR. The LDR, which in actuality replaces the indicating meter of the 2B set, maintains a cumulative record of the test results on two message registers, thus giving a much more accurate measurement reading than would be possible by a visual reading of the 2B indicating meter.

1.03 Test calls are made as covered in Section 226-836-500, from ten widely distributed subscriber line equipments to ten also widely distributed terminating lines in the same unit. This spreading of test lines should result in a reasonable cross-section of the traffic through the office. If the tests are made during relatively busy traffic periods, the traffic encountered will also tend to spread the test calls and simulate actual subscriber results.

1.04 Two test calls are made from each of the ten originating lines to each of the ten terminating lines giving a total of 200 intra-office calls with a noise measurement timing interval of 50 seconds on each call, or a total of 10,000 seconds of noise measurement for the office unit. Due to a one-second timing operation of the message register circuit this allows a maximum of 50 registrations on each register per call. The LDR can also be used to score indefinitely on any connection.

1.05 The LDR and 2B set will normally be adjusted for step-by-step offices so that noise levels of 20 and 30 dba (decibel adjusted) will be recorded on the low level and high level registers, respectively.

The register readings are entered on Form E-3861 as covered in Section 226-836-500 and the difference in readings between successive test calls is totaled at the completion of the 200 calls. The total is used in analyzing the over-all test results.

#### 2. DESCRIPTION OF APPARATUS

2.01 The complete apparatus is mounted as a single unit in a metal carrying case 12-5/16 inches high by 10-1/2 inches wide by 8-7/16 inches deep (including cover) and weighs approximately 23 pounds. It requires an external 115-volt, 60-cycle power source and uses ten vacuum tubes, one of which is a neon glow discharge tube used as an indicator of circuit operation.

2.02 Fig. 1 shows a front view of the LDR with the cover opened. The power cord and the signal input cord enter near the bottom of the left-hand panel.

2.03 The low level register  $>.0$  (greater than 0) is in the center of the left-hand panel and the high level register  $>10$  (greater than 10) is in the corresponding position of the right-hand panel. Immediately above each register is the calibrating screw for adjusting the timing of the register circuit and at the top of each panel is the calibrating screw for adjusting the operating level of the register circuit.

2.04 The power switch is located on the left-hand panel immediately above the power cord and a measuring switch (for continuous operation) is at a corresponding location on the right-hand panel.

2.05 The control key for starting the electric timer - which is normally used for operating the LDR and which automatically stops after a measuring interval of 50 seconds - is located immediately above the continuous operation switch.

2.06 The neon glow discharge lamp appears near the top of the right-hand panel and two keys used in connection with the calibrating procedure are located near the top of the left-hand panel.

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2.07 The hinged cover of the metal case is also used to store the two permanently connected cords when not in use. The input cord is of the shielded type as a protection against induction from parallel circuits that may be in the vicinity of the test location and cause false variations in the noise signal.

### 3. CIRCUIT FEATURES (Fig. 2)

3.01 The circuit features provided in the 30A LDR consist of:

- (1) A common noise rectifier and integrating circuit.
- (2) Individual d-c amplifiers and trigger tube circuits for operating each of two message registers.
- (3) Calibrating means to provide the correct operating level and timing of the trigger tube circuits.
- (4) Electrical means for timing the measuring interval and stopping the LDR at the end of the interval.

3.02 The noise signal received from the 2B set is first rectified and then passed through the integrating circuit which also serves the purpose of providing approximately a 0.2-second time response. These conditions simulate the actions of the ear and correspond to the action of the rectifier-meter circuit of the 2B set.

3.03 The integrating circuit provides two levels of output which pass through two separate circuits, one associated with a low level register > 0 and the other with a high level register > 10. Each circuit comprises a d-c amplifier, the output of which is used to fire a trigger tube at a certain noise level which in turn operates the message register.

3.04 After the operation of the register, the trigger tube is rendered inoperative for a period of one second, by means of a resistance-condenser circuit through which voltage is supplied to the screen of the trigger tube. This one-second timing in conjunction with a cam-type motor driven 50-second timer controls the timing of the noise measurement on each test call and limits the registrations to a maximum of 50 when the timing of the LDR is properly calibrated.

3.05 Attached to the inside of the LDR cover is a figure showing the manner of connecting the related sets and apparatus for

making noise measurements. This figure also covers routine calibration of the equipment and the procedure to be followed in making measurements.

### 4. MAINTENANCE

4.01 It is necessary when a 30A LDR is first used with a particular 2B noise measuring set, that a primary calibration be made as covered in Section 226-836-500. The meter deflection so obtained is entered on the LDR instruction card and is used thereafter in the routine calibration required after approximately each two hours of operation.

4.02 In the event of trouble arising in the LDR it will probably be impossible to calibrate the recorder properly; hence the existence of a trouble condition will be evident. The following paragraphs describe briefly various operating features which, together with the schematic circuit, Fig. 2, will be of assistance in the location of trouble.

4.03 Some trouble conditions can be located visually. For example, tube V8 should glow steadily as long as a-c power is supplied to the LDR. Failure of this tube to glow indicates failure of the d-c plate supply circuit or a faulty V8 tube.

4.04 The gas-tetrodes V5 and V7 will flash each time the associated register operates. If the glow of these tubes is not intermittent and simultaneous with the operation of the corresponding register, trouble is indicated in the a-c plate supply circuit or the contact on the register which discharges C3 (or C4). Failure of the contact may result in chattering of the register or greatly shortened intervals between registrations. Excessive brightness or prolonged flashing of V5 or V7 indicates that these tubes may be defective.

4.05 Inability to calibrate or continuous operation of the register regardless of input may be due to improper screen voltages on tubes V2 and V3 resulting from a defective "ADJ CAL" potentiometer P1 or P2. Continuous operation of a register will also occur if the d-c amplifier tubes (V2 or V3) associated with that step fail to conduct plate current.

4.06 Failure of a register to operate when sufficient input is being applied to the LDR may be due to mechanical failure of the register. If the register is stuck, the associated V5 or V7 tube will glow continuously and

under these conditions, serious overheating will occur if the power is not turned off. Failure of this type should be evident during the timing calibration or during actual measurements by high noise level heard in the monitoring receiver.

4.07 The timing of the low level > 0 step is determined by the adjustment of P3 and that of the high level > 10 step by P4, and trouble in these potentiometers may result in erratic timing. Erratic timing may also be caused by defective diodes V4 and V6.

4.08 Before looking for defective circuit elements, all vacuum tubes should be checked either directly or indirectly. If V8 glows steadily, it can be assumed that V8 and V9 are functioning properly. If one noise level step operates satisfactorily and the other does not, V5 and V7 may be cross-checked by interchanging tubes. The same procedure may be followed for

V4 and V6 and for V3 and V2, respectively. If neither step operates, the trouble may be due to failure of V1. This may be checked by substituting a new tube or interchanging V1 with V4 (or V6); if the trouble is in V1, the interchange should cause one of the register circuits to operate satisfactorily.

4.09 The cathode potentials of V4, V5, V6 and V7 are maintained at about 50 volts positive with respect to ground (chassis). Accidental grounding of any of these leads to the chassis will prevent normal operation. Trouble of this nature may be detected by removing V4 (or V6) from its socket and measuring the voltage between terminal 8 of the socket and the chassis.

Caution: Should the chassis be removed from the case and then energized, extreme caution should be exercised as dangerous voltages are exposed on many terminals.

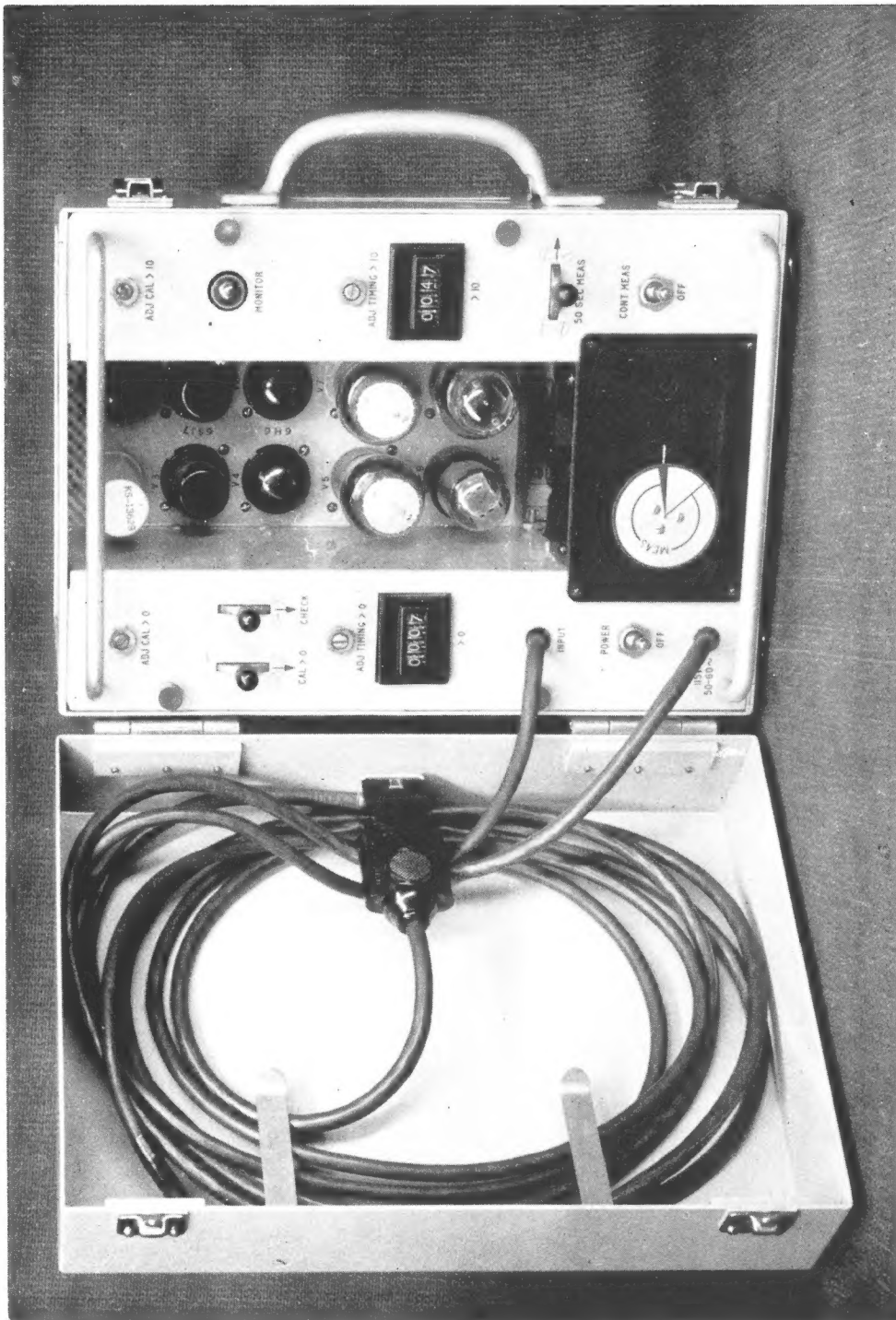


Fig. 1 - 30A Level Distribution  
Register Front View

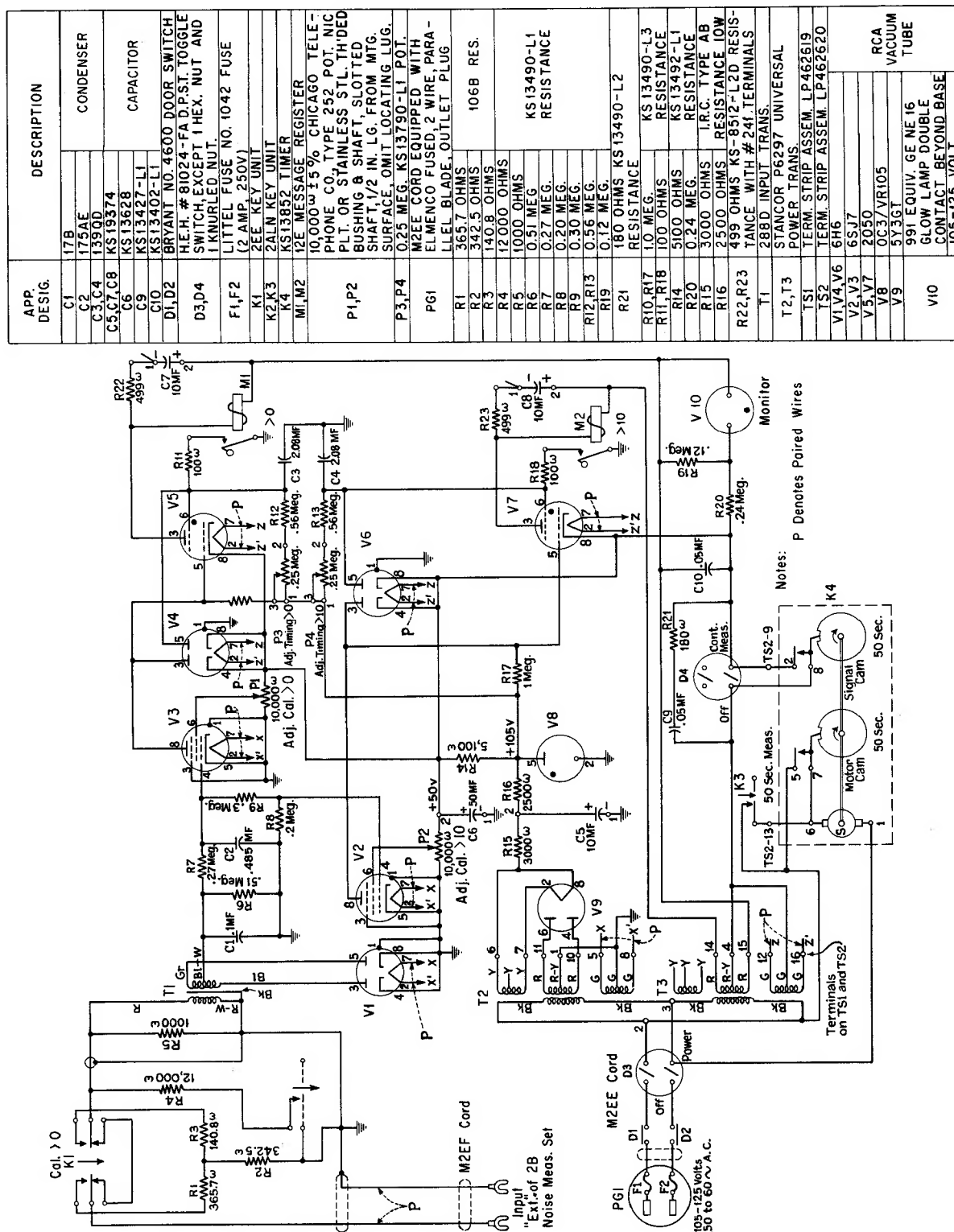


Fig. 2 - 30A Level Distribution Register  
Circuit and Apparatus List